



NTSB National Transportation Safety Board

Fatigue Management: Why, What, and How?

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Board Member, NTSB



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“My mind clicks on and off... I try letting one eyelid close at a time when I prop the other open with my will. But the effort's too much. Sleep is winning. My whole body argues dully that nothing, nothing life can attain is quite so desirable as sleep. My mind is losing resolution and control.”

NTSB reports on pilots falling asleep

Feds want to rewrite rules to curb fatigue

By Alan Levin
USA TODAY

WASHINGTON — Two airline pilots fell asleep while cruising over Hawaii last February, flying past their destination toward open ocean for 18 minutes before waking up and returning for a safe landing, federal accident investigators revealed Tuesday.

That incident and an accident in Traverse City, Mich., last year highlighted the need to stem the growing list of crashes attributed to the lengthy hours that pilots routinely work, the National Transportation Safety Board (NTSB) said. Crashes linked to fatigue have killed 249 people since 1997, according to NTSB records.



By Marco Garcia, AP

Fatigue to blame: Two Go Airlines pilots working a "demanding" schedule fell asleep and flew past their destination February.

"It's an insidious issue," NTSB Chairman Mark Rosenker said. "Many times the pilots themselves don't recognize that they are fatigued when they get into that cockpit."

The NTSB voted to recommend that federal aviation regulators and airlines use fatigue studies to rewrite the rules for

how long pilots can legally fly. Currently, federal law allows pilots to work up to 16 hours a day, including up to eight hours behind the controls, and loopholes allow longer days in some situations.

Air-traffic controllers frantically radioed Go Airlines Flight 1002 from Honolulu to Hilo,

Hawaii, for 18 minutes on Feb. 13, but got no response from the pilots, said NTSB investigator Jana Price.

In the safety board's first disclosure of details from the investigation, Price said both pilots "unintentionally fell asleep" as the Bombardier CRJ-200 jet flew at 21,000 feet. The jet carried 40 passengers.

The two pilots had been flying together for three arduous days that involved early start times and a "demanding" sequence of short flights, the captain had been diagnosed with severe obstructive sleep apnea, she said. Apnea causes people to repeatedly wake up during the night and has been linked to poor work performance and accidents.

In a separate investigation, the NTSB concluded that a regional airline crash last year in Traverse City was probably triggered by fatigue. Pinnacle Airlines Flight 4712 skidded off the end of a snowy runway on April

12, 2007, after landing in the early hours of the morning. None of the 49 passengers, two pilots and a flight attendant were injured.

The NTSB found that the pilots of the Bombardier CRJ-200 should never have attempted the landing.

The runway was too slick to land under the airline's rules, but the pilots failed to perform a basic landing calculation and missed other warning signs that the weather was deteriorating.

The accident happened after the pilots had worked 14 hours. The cockpit recording and the captain made repeated references to being tired, the NTSB found. The NTSB has been calling for reform of pilot work rules for decades. Several attempts to rewrite pilot work rules have failed in the face of opposition from airlines and pilot groups.

Contributing: Dennis Camire of Gannett News Service



DAVID J. PHILLIPS/NEWS ASSOCIATED PRESS

The NTSB concluded that this 2009 plane crash outside Buffalo was the result of pilot error and that the pilots were probably fatigued.

A lag for fatigue-related safety rules

Efforts to ensure pilots, fatigue not enough rest

The crash of Continental Connection Flight 3407 outside Buffalo in February 2009 heightened concerns about pilot fatigue. Four

This project

This article is one of several from a project detailing troubles with the

Seven years after that recommendation, a cruise ship ran aground off the Alaskan coast after its pilot erred while trying to guide the ship over a well-known



Car Shootout

Tested and rated by family. Results, 1-2, 4B

CHRISTOPHER TOWN & COURTESY BY CARFAX



nostalgic
Lady Gaga's latest album, *Born This Way*, draws influence from '80s. Review, 1D

By Dave Karger, CNN/Comcast

Many pilots exposed to fatigue

Thousands of flights are at riskier hours

By Alan Levin and Barbara Hansen
USA TODAY

Airlines operate thousands of flights each day that expose pilots to potentially dangerous fatigue, schedule data and the latest fatigue shows. A USA TODAY



Fatigue is Real and it Does Affect Safety

NTSB





“The nose is down, the wing low, the plane is diving and turning. I've been asleep with open eyes... I kick left rudder and pull the stick back...

“My eyes jump to the altimeter...I'm at 1600 feet. The turn-indicator leans over the left - the airspeed drops - the ball rolls quickly to the side...My plane is getting out of control!”

Continental Express, Pine Bluff, AR

- April 29, 1993
- EMB-120 RT
- Climbing through 17,400 msl
 - Stall, loss of control
 - 111 degree bank angle
 - 67 degrees nose down pitch
- Recovered at 5500 msl
- Left prop shed 3 blades
- Long forced landing on closed runway
- Runway overrun
- Crew's failure to maintain professional cockpit discipline, inattention to flight instruments, selection of inappropriate automation mode

Contributing to the accident: Fatigue induced by the flightcrew's failure to properly manage provided rest periods.

American International Airways

- August 18, 1993
- DC-8 freighter
- Guantanamo Bay Naval Air Station, Cuba
- Stall and loss of control on final approach
- 3 Serious injuries



Probable Cause:

“The impaired judgment, decision-making, and flying abilities of the captain and flightcrew due to the effects of fatigue...”



Korean Airlines flight 801



- August 6, 1997
- B-747-300
- Nimitz Hill, Guam
- CFIT
- 228 Fatalities
- 26 Serious

“The captain was fatigued, which degraded his performance and contributed to his failure to properly execute the approach.”



American Airlines flight 1420

- June 1, 1999
- MD-82
- Little Rock, AR
- Runway overrun
- 11 Fatalities
- 45 Serious



“Contributing to the accident was the flight crew’s impaired performance resulting from fatigue ...”

Corporate Airlines dba American Connection Flight 5966



- October 19, 2004
- Kirksville, Missouri
- BAE J-32 (Jetstream)
- Nighttime non-precision instrument approach
- CFIT
- 13 fatalities
- 2 serious injuries

Recipe for fatigue-related accident

- Crew on duty 14 ½ hours
 - Previous two days long also
- Less than optimal overnight rest time available
- Early reporting time
- 6th flight of day
- Low ceilings and visibility throughout the day
- High demands of manually-flown nighttime, non-precision approach
 - **PLUS** –
- Crew failure to follow SOPs and less than professional demeanor

Shuttle America, Inc., dba Delta Connection Flight 6448



- February 18, 2007
- Embraer ERJ-170
- Cleveland, Ohio
- Runway Overrun
- No fatalities

Shuttle America

- Captain had slept only 1 out of the past 32 hours.
 - Did not advise Shuttle America of his fatigue or remove himself from duty because he thought he would be terminated.
- Captain stated that his lack of sleep:
 - affected his ability to concentrate and process information to make decisions
 - he was not “at the best of [his] game.”

Shuttle America

Contributing to the Probable Cause:

“the captains’ fatigue, which affected his ability to effectively plan for and monitor the approach and landing, and

“Shuttle America’s failure to administer an attendance policy that permitted flight crewmembers to call in as fatigued without fear of reprisals.”

Pinnacle Airlines flight 4712



- April 12, 2007
- Bombardier/Canadair RJ CL600-2B19
- Traverse City, Michigan
- Runway Overrun
- No fatalities

Probable Cause:

“...poor decision-making likely reflected the effects of fatigue produced by a long, demanding duty day and, for the captain, the duties associated with check airman functions.”



FedEx at Tallahassee, Florida

- July 26, 2002
- FedEx Boeing 727-200
- CFIT, approach and landing accident
- 3 serious injuries
- Aircraft destroyed



NTSB Findings



- “The captain was likely impaired by fatigue and this impairment contributed to his degraded performance (especially in the areas of crew coordination and monitoring) during the approach.”
- “The circumstances of this accident, in part, demonstrate the continuing need for fatigue management efforts...”

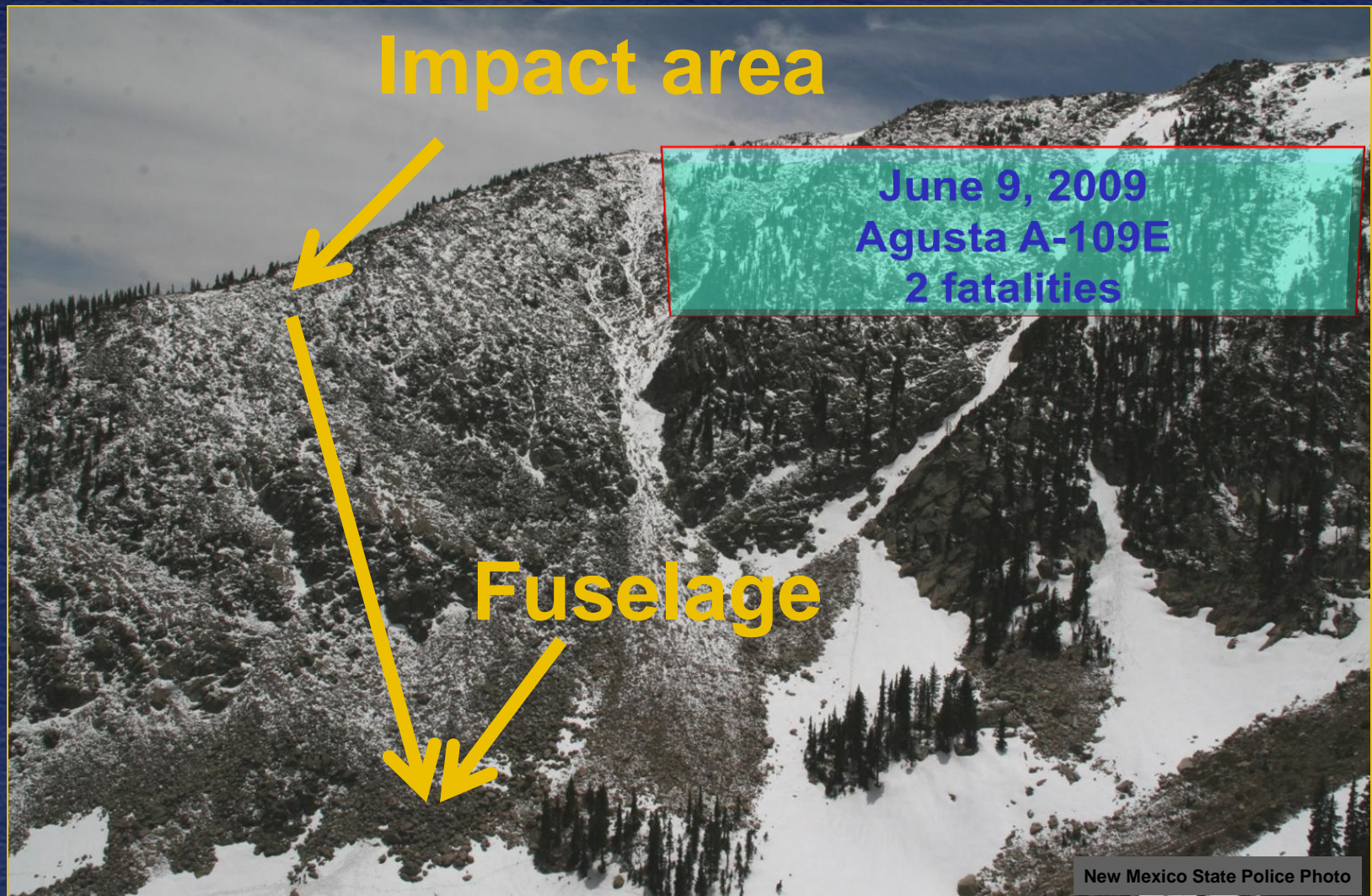
Med Flight Air Ambulance, Inc



“Contributing to the accident was the pilots’ fatigue, which likely contributed to their degraded decision-making.”

- Oct. 24, 2004
- Learjet 35A
- San Diego, CA
(departing Brown Field)
- Nighttime repositioning
for an EMS
- CFIT, mountainous
terrain
- 5 Fatalities

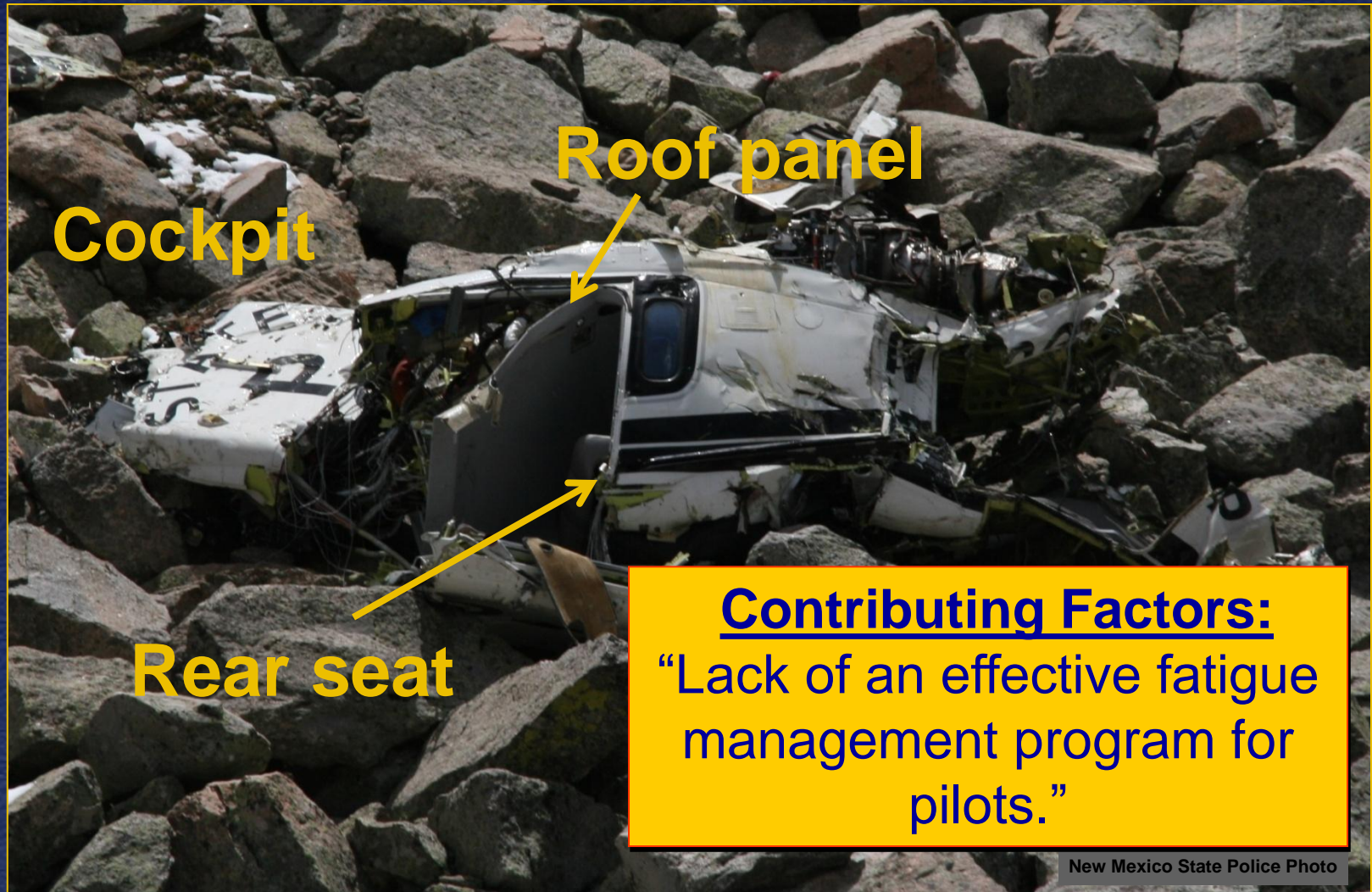
New Mexico State Police



NTSB



New Mexico State Police



NTSB



**East Coats Jets
Hawker Beechcraft BAe 800
July 31, 2008
8 fatalities**



NTSB Finding:

“Both pilots’ performance was likely impaired by fatigue that resulted from their significant acute sleep loss, early start time, and possible untreated sleep disorders, and fatigue might have especially degraded the captain’s performance and decision-making abilities”

NTSB Recommendation



“Require Part 135 and 91 subpart K pilots to receive initial and recurrent education and training on factors that create fatigue in flight operations, fatigue signs and symptoms, and effective strategies to manage fatigue and performance during operations.”

Empire Airlines flight 8284

- January 27, 2009
- Stall, loss of control on approach
- Lubbock, TX



Contributing Factors:

- Fatigue due to time of day
- Cumulative sleep debt

Sundance Helicopters



- December 7, 2011
- 5 Fatalities

“Contributing to improper installation of the split pin was the mechanic’s fatigue.”



NTSB Finding from Sundance

“All maintenance personnel would benefit from receiving ... training on the causes of fatigue, its effects on performance, and actions individuals can take to prevent the development of fatigue, which would help to reduce the likelihood of human errors in aviation maintenance.”

Colgan Air



NTSB

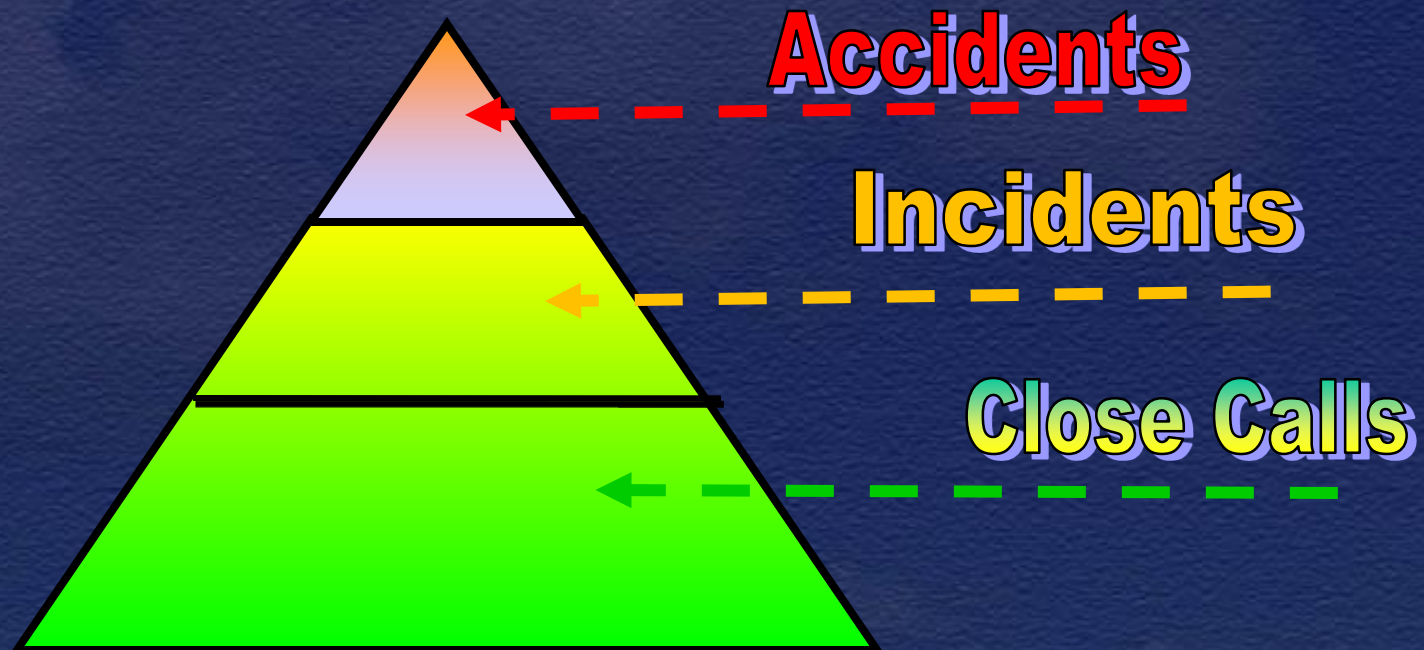


Personal Responsibility

- “All pilots, including those who commute to their home base of operations, have a personal responsibility to wisely manage their off-duty time and effectively use available rest periods so that they can arrive for work fit for duty;
- “The accident pilots did not do so by using an inappropriate facility during their last rest period before the accident flight.”

– NTSB Report of Colgan Air crash

Accidents are Just “Tip of the Iceberg”



FedEx at Tallahassee, Florida

- July 26, 2002
- FedEx Boeing 727-200
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NTSB



Fatigue: time of day



National Transportation Safety Board

FedEx Flight 1478, Boeing 727-232 (N497FE)

American International Airways

- DC-8 freighter
- Stall and loss of control on final approach
- Guantanamo Bay Naval Air Station, Cuba
- August 18, 1993

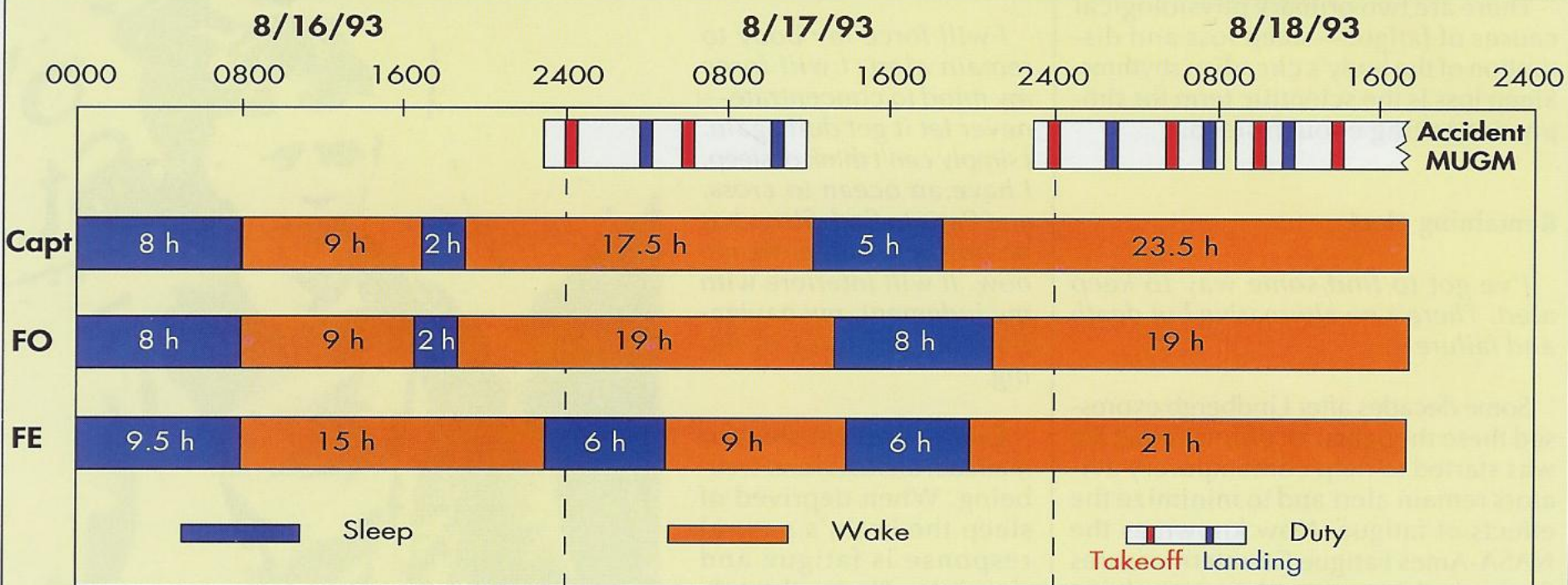
NTSB: Fatigue was a direct factor



NTSB's Investigation Looked at:

- Cumulative sleep loss
- Continuous hours awake
- Time of day

AIA Flt 808 crew sleep/wake histories



NTSB



Cumulative Sleep Loss

In the 48 hours prior to the accident:

- The Captain had slept 8 hours
- The F/O had slept 10 hours
- The F/E had slept 12 hours

Continuous Hours Awake

Prior to the accident:

- The Captain had been awake 23.5 hrs
- The F/O had been awake 19 hrs
- The F/E had been awake 21 hrs

Time of Day

- The accident occurred at 4:56 PM
- The body's afternoon physiological "low point" typically occurs between 3-5 PM
 - decreased alertness and performance

NTSB

“The effects of fatigue are particularly prevalent when all these three factors overlap...”

The crew had:

- limited sleep in the previous 48 hours
- been awake more than 19 hours during both day and night periods
- to be at a high level of alertness during a period of time (3-5 PM) associated with sleepiness.



“I’ve got to find some way to keep alert. There’s no alternative but death and failure.”



NTSB